

## What is claimed is:

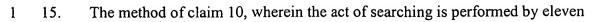
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- 2 a parallel frame delineation module having a plurality of concurrent
- 3 comparators to delineate received frame boundaries within a Universal Serial Bus
- 4 (USB) peripheral non-return to zero invert (NRZI) data stream; and
- 5 an NRZI decoder module to decode received NRZI encoded data using
- 6 parallel data processing.
- 1 2. The integrated circuit of claim 1, wherein the USB peripheral NRZI data
- 2 stream follows a protocol defined in version 2.0 of the USB specification.
- 1 3. The integrated circuit of claim 2, wherein the parallel frame boundary
- 2 delineation module comprises a three-stage pipeline.
- 1 4. The integrated circuit of claim 3, further comprising a pipeline control state
- 2 machine.
- 1 5. The integrated circuit of claim 3, wherein the parallel frame boundary
- delineation module further comprises a parallel start-of-packet detector.
- 1 6. The integrated circuit of claim 5 wherein the parallel start-of-packet detector
- 2 comprises eleven concurrent comparators.
- 1 7. An apparatus comprising:
- one or more Universal Serial Bus (USB) connectors to couple to a
- 3 communications channel carrying a USB data stream;
- 4 an application specific integrated circuit comprising a USB transceiver, a
- 5 serial interface engine and apparatus-specific logic, the USB transceiver having
- 6 concurrent comparators to delineate received asynchronous frame boundaries within
- 7 the USB data stream and parallel logic to decode received encoded data.

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- 2 logic for an apparatus selected from the group consisting of: a hub, a digital camera,
- a video-conferencing camera, a printer, a keyboard, a scanner, a modem, a digital
- 4 phone, a removable media drive, a CD/DVD drive, a gaming device, a hard drive, a
- 5 mouse, a trackball, a pointer, a display device, a speaker and a networking device.
- 1 9. The apparatus of claim 7, wherein the parallel logic decodes non-return to
- 2 zero invert (NRZI) encoded data.
- 1 10. A method of delineating asynchronous frame boundaries in a Universal
- 2 Serial Bus (USB) data stream, the method comprising:
- 3 receiving a USB data stream;
- 4 searching for a frame delineation marker in the data received using
- 5 concurrent comparators;
- 6 asserting a flag upon detection of the frame delineation marker; and
- 7 creating a vector indicating a location of a frame boundary in the data
- 8 stream.
- 1 11. The method of claim 10, wherein the USB data stream comprises non-return
- 2 to zero invert (NRZI) data.
- 1 12. The method of claim 11, wherein the NRZI data is received in nine-bit
- 2 fields.
- 1 13. The method of claim 10, wherein the act of searching for a frame delineation
- 2 marker is performed concurrently on a twenty-seven bit field of data.
- 1 14. The method of claim 13, wherein the frame delineation marker comprises
- 2 "00101010".



- 2 concurrent comparators.
- 1 16. The method of claim 10, wherein the vector created comprises an eleven-bit
- 2 vector.
- 1 17. An integrated circuit comprising:
- 2 a three-stage pipeline to receive consecutive nine-bit fields of data from an
- 3 incoming Universal Serial Bus (USB) data stream; and
- 4 a parallel start-of-packet detector having concurrent comparators to identify
- 5 a frame delineation marker in the incoming USB data stream.
- 1 18. The integrated circuit of claim 17, further comprising a non-return to zero
- 2 invert (NRZI) data decoder to decode the incoming USB data stream.
- 1 19. The integrated circuit of claim 18, further comprising a state machine to
- 2 determine when the incoming USB data stream contains valid data.